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In Re Application Of: **Douglas P. Brown and Paul L. Sinclair**

Serial No.	Filing Date	Examiner	Group Art Unit
09/608,976	June 30, 2000	Y Te Chen	2171

Invention: **Method And Apparatus For Presenting Query Plans**

TO THE COMMISSIONER FOR PATENTS:

Transmitted herewith in triplicate is the Appeal Brief in this application, with respect to the Notice of Appeal filed on **January 20, 2004.**

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#18
3/31/04

Applicant:	Douglas P. Brown, et al.	§	Group Art Unit:	2171
Serial No.:	09/608,976	§		
		§	Examiner:	Y Te Chen
Filed:	June 30, 2000	§		
For:	METHOD AND APPARATUS FOR PRESENTING QUERY PLANS	§	Atty. Dkt. No.:	9020 (NCR.0012US)

MAIL STOP APPEAL BRIEF – PATENTS
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APPEAL BRIEF

Sir:

Applicant respectfully appeals from the final rejection mailed October 17, 2003.

I. REAL PARTY IN INTEREST

The real party in interest is NCR Corporation, the assignee of the present application by virtue of the assignment recorded at Reel/Frame 011272-0011.

II. RELATED APPEALS AND INTERFERENCES

None.

III. STATUS OF THE CLAIMS

Claims 1-27 and 29-41 have been finally rejected and are the subject of this appeal.

IV. STATUS OF AMENDMENTS

No amendments were submitted after the final rejections.

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V. SUMMARY OF THE INVENTION

According to one embodiment, the invention relates to a method of presenting an execution plan for a query that includes determining steps of the query execution plan for a parallel database system, displaying the steps of the query execution plan in a graphical user interface, and depicting parallel execution of steps of the query execution plan in the graphical user interface, where such depicting includes displaying plural elements corresponding to concurrently executing plural steps on respective processors of the database system (claim 1). *See also*, claim 30. According to some implementations, the parallel database system can be a database system having plural nodes with plural processors, plural processing units, or plural virtual processors. Each step of the execution plan in the parallel database system can be represented as an icon in the graphical user interface, with the icons connected by lines to represent the flow of steps in the execution plan. Specification, p. 3, ll. 10-13; p. 4, ll. 6-19, p. 5, ll. 4-9; p. 8, ll. 9-16; p. 9, l. 16-p. 10, l. 15.

According to another embodiment, the invention relates to a method of testing performance of a query that includes determining a first execution plan of the query under a first condition, determining a second execution plan of the query under a second condition, and displaying the first and second execution plans concurrently to enable comparison of the execution plans (claim 11). As described in the specification of the present application, such a feature is referred to as a visual explain and compare feature that allows a user to compare execution plans of a given query under different conditions (e.g., such as execution plans generated by different versions of an optimizer program, execution plans for systems having different arrangements, or execution plans for tables having different content). The visual explain and compare feature is provided by a visual explain and compare component executable in the system, which may be a test system or a target (or customer) system. When executed on a

target system, the visual explain and compare component allows a user at the target system to visually view execution plans as well as compare execution plans of a query under different conditions. Specification, p. 3, ll. 19-26; p. 12, ll. 17-29.

According to yet another embodiment, the invention relates to a system having a graphical user interface, and a controller to determine an execution plan of a query based on emulation data that emulates an environment of a target system in which a parallel database system is implemented, with the controller to display a representation of the execution plan in the graphical user interface (claim 23). For example, as described by the specification, when executed on a test system that is remote from a target (or customer) system, the visual explain and compare component is able to work with execution plans generated in an emulated environment of the target system. Target-level emulation in the test system to emulate the target system is performed by capturing environment information from the target system. An extractor module in the target system extracts the desired target environment information and communicates the environment information to the test system. The captured target environment information is stored in and/or mapped to appropriate tables, files, and other storage locations in the test system. Execution plans are generated based on the emulated environment, with the visual explain and compare component used to visually depict the generated execution plans. Specification, p. 3, l. 27-p. 4, l. 5; p. 14, l. 20-p. 17, l. 16.

Although several embodiments have been described above, other embodiments are also covered by the claims on appeal.

VI. ISSUES

A. Are Claims 1-6, 9-22, 30, 31, and 34-41 Obvious Over the Asserted Combination of Hallmark and MacLeod?

B. Is Claim 23 Obvious Over the Asserted Combination of MacLeod and Reiner, and Are Claims 24-27 and 29, Which Depend from Claim 23, Obvious Over the Asserted Combination of MacLeod, Reiner and Carino?

C. Are Claims 7, 8, 32, and 33 Obvious Over Hallmark, MacLeod, and Reiner?

VII. GROUPING OF THE CLAIMS

Group 1: Claims 1, 2, 4-6, 9, 10, 30, and 31.

Group 2: Claims 11-14, 16, 18, 20, and 37.

Group 3: Claims 23-27, 29.

Group 4: Claims 7 and 8.

Group 5: Claims 21 and 22.

Group 6: Claims 32 and 33.

Group 7: Claims 35, 36, 40, and 41.

Group 8: Claims 38 and 39.

Within each group, the claims stand and all together. Claims 3, 15, 17, 19, and 34 are not part of any group.

VIII. ARGUMENT

All claims should be allowed over the cited references for the reasons set forth below.

A. Are Claims 1-6, 9-22, 30, 31, and 34-41 Obvious Over the Asserted Combination of Hallmark and MacLeod?

Independent claims 1 and 30

Independent claim 1 was rejected over the asserted combination of Hallmark and MacLeod. The Examiner cited Hallmark as disclosing the act of determining steps of the query execution plan for a parallel database system in claim 1. However, the Examiner conceded that Hallmark fails to disclose the following elements of claim 1 (*see* 10/17/03 Office Action at 3):

- displaying the steps of a query execution plan (for a parallel database system) in a graphical user interface;
- depicting parallel execution of steps of the query execution plan in the graphical user interface;
- wherein depicting the parallel execution of steps comprises displaying plural elements corresponding to concurrently executing plural steps on respective processors of the parallel database system.

The Examiner incorrectly relied upon MacLeod as disclosing the elements missing from Hallmark. Applicant respectfully submits that MacLeod fails to teach or suggest either of the displaying or depicting acts of claim 1. The Examiner stated that "MacLeod specifically teaches a GUI to display the parallel query execution plan in form [sic] of tree structure [e.g., col. 8, lines 7-12; col. 8, line 60-col. 9, line 4; Fig(s) 5-9]." 10/17/03 Office Action at 15-16. The error made in this statement is that the cited passages clearly do not teach or even remotely suggest displaying steps of a query execution plan (for a parallel database system) in a graphical user interface, and depicting parallel execution of steps of the execution plan in the graphical user interface by displaying plural elements corresponding to concurrently executing plural steps on

respective processors of the parallel database system, as recited in claim 1. Figures 5 and 6 of MacLeod, which are related to the passages cited by the Examiner, clearly illustrate the point that MacLeod does not teach or suggest displaying or depicting parallel execution of plans in a graphical user interface. Figure 5 of MacLeod displays two different query plans for two different queries, not *parallel execution* of steps of the query execution plan. *See* MacLeod, 7:13-16 (Figure 5 depicts a user interface that shows graphical analysis of *two* specified queries). Figure 6 of MacLeod depicts a user interface that shows graphical analysis of one specified query with multiple operations. MacLeod, 8:29-32. Although the display of the tree structure 210 of Figure 6 represents an execution plan that has operation node icons 211 to represent different operations of the execution plan, the displayed tree structure 210 does not display plural elements corresponding to concurrently executing plural steps on respective processors of the parallel database system.

Because neither Hallmark nor MacLeod teaches or suggests either the displaying or depicting acts recited in claim 1, their hypothetical combination also fails to disclose or suggest the elements of the claim 1. For at least this reason, a *prima facie* obviousness rejection has not been established with respect to claim 1.

Moreover, there is no suggestion or motivation to combine Hallmark and MacLeod. Although Hallmark describes implementing parallel processing in a database management system, there is no suggestion anywhere within Hallmark of the need for displaying steps of a generated query execution plan in a graphical user interface. MacLeod, similarly, is silent on depicting *parallel execution* of steps of a query execution plan in a graphical user interface. A person of ordinary skill in the art, at the time of the invention, looking to Hallmark and MacLeod, would find no suggestion or motivation to combine the teachings of Hallmark and

MacLeod. The Examiner cited the following motivation for combining Hallmark and MacLeod: "[t]he motivation being to have enabled a user to provide information for optimizing a query in a massively parallel system and to pop up multiple display screens illustrating multiple execution query plans so that a user may select the most desirable." 4/24/2003 Office Action at 2-3. Applicant respectfully notes that the cited motivation mis-states the invention. The invention is directed to displaying plural elements corresponding to concurrently executing plural steps on respective processors of a parallel database system. The motivation for enabling a user to provide information for optimizing a query in a massively parallel system and to pop up multiple display screens illustrating multiple execution query plans would not have led a person of ordinary skill in the art to the claimed invention.

The Examiner also argued that the motivation and suggestion lies in the fact that a user "can use the GUI [of MacLeod] to monitor, compare, select, and create most efficient query execution plan as desired." 10/17/03 Office Action at 16. However, this statement fails to provide any rationale regarding why any person of ordinary skill in the art would have been motivated to modify the GUI of MacLeod to display and depict parallel execution of steps of a query execution plan for a parallel database system. Without the impermissible hindsight benefit of the present invention, a person of ordinary skill in the art looking only at the teachings of Hallmark and MacLeod would not have been motivated to provide a GUI to display and depict parallel execution of steps of an execution plan for a parallel database system.

For this additional reason, a *prima facie* case of obviousness has not been established with respect to claim 1. Independent claim 30 is also not obvious over the asserted combination of Hallmark and MacLeod for similar reasons.

For the foregoing reasons, claim 1 and claim 30, and all their dependent claims, are allowable over the cited references.

Moreover, with respect to claim 3 (which depends from claim 1), the Examiner cited col. 7, lines 1-19, of Hallmark as disclosing determining the steps of a query execution plan for a parallel database system running in a platform having plural virtual processors to handle access to data in the parallel database system. The cited passage does not refer whatsoever to determining steps of a query execution plan for a parallel database system having *plural virtual processors*.

Claim 35, which depends from claim 1, further recites that displaying the plural elements comprises displaying the plural elements side-by-side to indicate concurrent execution of respective steps. None of the Figures of MacLeod, nor the accompanying text, indicates or even remotely suggests that plural elements corresponding to concurrently executing plural steps on respective processors of a parallel database system are displayed side-by-side to indicate concurrent execution of the respective steps. Although the passage of MacLeod cited by the Examiner (column 7, lines 49-61) refers to the display of icons, such icons do not correspond to concurrently executing plural steps on processors of parallel database systems that are displayed side-by-side.

Claim 34, which depends from claim 30, recites the displaying of steps of the second execution plan *concurrently* with steps of the first execution plan in a graphical user interface. The Examiner cited to Figures 5 and 6 and corresponding text of MacLeod as disclosing the displaying act. Figure 5 shows a user interface that depicts graphical analysis of *two* specified queries, not one query as recited in claim 34. Figure 6 shows only one execution plan for one query. Neither Figure 5 nor Figure 6 teaches or even remotely suggests displaying steps of a

second execution plan for a query concurrently with steps of the first execution plan for the same query in a graphical user interface.

Claim 40 (which depends from claim 30) is allowable over the cited references for reasons similar to those for claim 35.

Independent claim 11.

Claim 11 was also rejected over the asserted combination of Hallmark and MacLeod. The Examiner cited to column 6, lines 11-54, of Hallmark, and Figure 6 of MacLeod as disclosing the first two acts of claim 11, namely determining a first execution plan of the query under a first condition, and determining a second execution plan of the query under a second condition. The column 6 cited passage of Hallmark does not disclose determining plural execution plans of the same query. Figure 6 of MacLeod depicts a user interface showing graphical analysis of one specified query with multiple operations. Only one execution plan is depicted in Figure 6. *See,* MacLeod, 8:43-45 ("Here again the query analyzer element 370 displays a tree structure 210 representing *the execution plan* associated with the specified SQL query."). Therefore, the Examiner is incorrect in stating that the determining acts of claim 11 are taught by Hallmark or MacLeod.

Moreover, the Examiner cited to Figures 6 and 7 and corresponding text of MacLeod as disclosing the displaying act. In citing MacLeod as disclosing the displaying act, the Examiner does not address how MacLeod teaches or suggests *concurrently* displaying first and second query execution plans of the same query under first and second conditions.

The screen shown in Figure 7 of MacLeod appears to be identical to the screen shown on Figure 6 of MacLeod except for the further display of cost statistics. Therefore, Figures 6 and 7 of MacLeod do not depict displaying first and second query execution plans of the same query

under first and second conditions. Moreover, Figures 6 and 7 are separate screens shown at different times, and therefore, cannot possibly satisfy the claim element of displaying first and second execution plans *concurrently*.

For the foregoing reasons, the *prima facie* case of obviousness against claim 11 is defective. Claims dependent from claim 11 are allowable over the cited references for at least the same reasons.

With respect to claim 15, which depends from claim 11, neither Hallmark nor MacLeod discloses or even remotely suggests displaying first, second, and third execution plans *concurrently* to enable comparison of the execution plans. The Examiner cited to Figure 9 and corresponding text of MacLeod as disclosing the displaying act. However, Figure 9 does not show the display of first, second, and third execution plans *concurrently*.

Moreover, with respect to dependent claim 17, which depends from claim 16 (which in turn depends from claim 11), the Examiner cited to column 16, lines 32-42, of Hallmark as disclosing the determining acts performed by claim 17. Note that claim 17 recites determining the first execution plan for a query in cooperation with a first version of a software module of a parallel database system and determining the second execution plan for a query in cooperation with a second version of the software module of the parallel database system. The column 6, passage cited by the Office Action makes no mention whatsoever of determining different execution plans for different versions of a software module.

With respect to dependent claim 19 (which depends from 18, which in turn depends from claim 11), the Examiner cited to col. 16, lines 53-61, of Hallmark as disclosing the determining acts recited in claim 19. Claim 19 recites determining the first execution plan for a query in a system having a first arrangement, and determining a second execution plan for a query in a

system having a second arrangement. The cited passage in column 16 of Hallmark makes no mention of determining two execution plans for two arrangements of a system.

With respect to claim 21 (which depends from claim 20, which in turn depends from claim 11), the Examiner cited to Figure 6 of MacLeod and column 17, lines 16-23, of Hallmark as disclosing the determining acts of claim 21. Applicant respectfully disagrees, as the cited portions of MacLeod and Hallmark do not disclose or suggest determining a first execution plan that involves a table having a first content, and determining a second execution plan that involves the table having a second content.

Similarly, with respect to claim 38, which depends from claim 37, which in turn depends from claim 11, the hypothetical combination of MacLeod and Hallmark does not disclose or suggest displaying plural elements side-by-side to indicate concurrent execution of respective steps.

B. Is Claim 23 Obvious Over the Asserted Combination of MacLeod and Reiner, and Are Claims 24-27 and 29, Which Depend from Claim 23, Obvious Over the Asserted Combination of MacLeod, Reiner and Carino?

Independent claim 23 was rejected as being obvious over MacLeod and Reiner. As conceded by the Office Action, MacLeod does not disclose a controller to determine an execution plan of a query based on emulation data that emulates an environment of a target system in which a parallel database system is implemented. Rather, the Office Action cited to column 31, lines 1-14 of Reiner as disclosing this element of claim 23. Applicant respectfully disagrees that Reiner discloses the missing element. First, Applicant notes that claim 23 recites determining an execution plan of a query based on emulation data that *emulates an environment of a target system in which a parallel database system is implemented.*

The cited passage in Reiner describes a set or routines (PUPI) that emulates the calling sequence and behavior of UPI routines. The cited passage also discusses combining results to emulate the result of an original query. Thus, two emulations are referred to in column 31 or Reiner, emulating a calling sequence and behavior of a set of routines (the UPI routines), and emulating the result of a query. There is no teaching whatsoever in Reiner of emulating an environment of a target system in which a parallel database system is implemented.

Although column 31 of Reiner also refers to POPI (parallel ORACLE program interface) routines, such POPI routines do not *emulate* an environment of a target system in which a parallel database system is implemented. As stated by Reiner, the POPI routines behave as a client with respect to additional servers to which the POPI routines connect from parallel threads to process parallel subqueries. This behavior of the POPI routines does not constitute the emulation of an environment of a target implementing a parallel database system. Therefore, even if MacLeod and Reiner can be properly combined, the hypothetical combination does not teach or suggest the invention of claim 23.

A *prima facie* case of obviousness has thus not been established with respect to claim 23. Because of the improper application of the combination of MacLeod and Reiner against claim 23, the obviousness rejection of claim 24-27 and 29 over MacLeod, Reiner, and Carino is also defective.

For the reasons above, the final rejection of claims 23-27 and 29 should be reversed.

C. Are Claims 7, 8, 32, and 33 Obvious Over Hallmark, MacLeod, and Reiner?

Dependent claims 7, 8, 32, and 33 were rejected as being obvious over the asserted combination of Hallmark, MacLeod, and Reiner. Reiner was relied upon as disclosing the following feature of claim 7: determining steps of a query execution plan by an optimizer based

on *emulated environment data of a target system that comprises a parallel database system*. As discussed above in connection with claim 23, Reiner fails to disclose emulation of a target system that includes a parallel database system. Therefore, the hypothetical combination of Hallmark, MacLeod, and Reiner fails to disclose or suggest the subject of claim 7.[1]

Claims 8, 32, and 33 are similarly allowable over the hypothetical combination of Hallmark, MacLeod, and Reiner.

For the reasons set above, the final rejection of claims 7, 8, 32, and 33 should be reversed.

IX. CONCLUSION

Applicant respectfully requests that each of the final rejections be reversed and that the claims subject to this appeal be allowed to issue.

Respectfully submitted,

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[1] Moreover, the other elements of claim 7 (which depends from claim 6, which in turn depend from claim 1) are not taught or suggested by the hypothetical combination of Hallmark, MacLeod, and Reiner, based on Applicant's discussion with respect to the rejections over Hallmark and MacLeod.

CLAIMS ON APPEAL

1. A method of presenting an execution plan for a query, comprising:

determining steps of the query execution plan for a parallel database system;

displaying the steps of the query execution plan in a graphical user interface; and

depicting parallel execution of steps of the query execution plan in the graphical user interface,

wherein depicting the parallel execution of steps comprises displaying plural elements corresponding to concurrently executing plural steps on respective processors of the parallel database system.

2. The method of claim 1, wherein determining the steps comprises determining steps of the query execution plan for the parallel database system running in a multiprocessing platform having plural processors.

3. The method of claim 1, wherein determining the steps comprises determining steps of the query execution plan for the parallel database system running in a platform having plural virtual processors to handle access to data in the parallel database system.

4. The method of claim 1, wherein displaying the plural elements comprises displaying plural icons.

5. The method of claim 4, wherein the database management system is executable in a platform, and wherein displaying the icons comprises displaying one or more of the icons selected from the group consisting of an icon representing a table, an icon representing an operation performed on a component of the platform, an icon representing a query statement, and icon representing an operation performed on two or more tables.

6. The method of claim 1, wherein determining the steps of the query execution plan is performed by an optimizer.

7. The method of claim 6, wherein determining the steps of the query execution plan is performed by the optimizer based on emulated environment data of a target system, the optimizer and emulated environment data present in a test system, the target system comprising the parallel database system.

8. The method of claim 1, wherein determining the steps of the query execution plan is performed in a test system based on emulated environment data of a target system that is separate from the test system, the target system comprising the parallel database system.

9. The method of claim 1, further comprising displaying explain text of the query execution plan.

10. The method of claim 9, wherein displaying the explain text comprises displaying the explain text in a first screen, and wherein displaying the steps of the query execution plan comprises displaying the steps in a second screen.

11. A method of testing performance of a query, comprising:

determining a first execution plan of the query under a first condition;

determining a second execution plan of the query under a second condition; and

displaying the first and second execution plans concurrently to enable comparison of the execution plans.

12. The method of claim 11, wherein displaying the first and second execution plans comprises displaying the execution plans in a graphical user interface.

13. The method of claim 11, wherein displaying the first and second execution plans comprises displaying the execution plans in a graphical user interface having a first screen to display the first execution plan and a second screen to display the second execution plan.

14. The method of claim 11, wherein displaying the first and second execution plans comprises displaying a collection of icons to represent steps of each of the execution plans.

15. The method of claim 11, further comprising:

determining a third execution plan of the query under a third condition; and

displaying the first, second, and third execution plans concurrently to enable comparison of the execution plans.

16. The method of claim 11, wherein determining the first execution plan comprises determining an execution plan for the query in cooperation with a first version of a software module of a parallel database system.

17. The method of claim 16, wherein determining the second execution plan comprises determining an execution plan for the query in cooperation with a second version of the software module of the parallel database system.

18. The method of claim 11, wherein determining the first execution plan comprises determining an execution plan for the query in a system having a first arrangement.

19. The method of claim 18, wherein determining the second execution plan comprises determining an execution plan for the query in a system having a second arrangement.

20. The method of claim 11, wherein determining the first execution plan comprises determining an execution plan involving a table having a first content.

21. The method of claim 20, wherein determining the second execution plan comprises determining an execution plan involving the table having a second content.

22. The method of claim 21, wherein the second content contains statistics.

23. A system comprising:

a graphical user interface; and

a controller to determine an execution plan of a query based on emulation data that emulates an environment of a target system in which a parallel database system is implemented,

the controller to display a representation of the execution plan in the graphical user interface.

24. The system of claim 23, wherein the emulation data comprises cost-related information including a number of nodes in the target system and a number of CPUs in each node.

25. The system of claim 23, wherein the emulation data comprises cost-related information including a number of virtual processors running in the target system.

26. The system of claim 23, wherein the emulation data comprises cost-related information relating to costs of doing operations in the target system.

27. The system of claim 23, wherein the emulation data represents a target system having a multi-node parallel processing system.

29. The system of claim 23, wherein the emulation data represents a target system running plural virtual processors for handling access to the parallel database system.

30. An article comprising one or more storage media containing instructions that when executed cause a controller to:

determine an execution plan of a query for a parallel database system;

display the steps of the execution plan in a graphical user interface; and

depict parallel execution of steps of the execution plan in the graphical user interface,

wherein depicting the parallel execution of steps comprises displaying plural elements corresponding to concurrently executing plural steps on respective processors of the parallel database system.

31. The article of claim 30, wherein the instructions when executed cause the controller including an optimizer to determine the execution plan of the query.

32. The article of claim 30, wherein the instructions when executed cause the controller to receive environment information to emulate a target database system.

33. The article of claim 32, wherein the instructions when executed cause the controller to determine the execution plan of the query based on the environment information.

34. The article of claim 30, wherein the execution plan comprises a first execution plan, wherein the instructions when executed cause the controller to further:

determine a second execution plan of the query for the parallel database system;

display the steps of the second execution plan concurrently with the steps of the first execution plan in the graphical user interface.

35. The method of claim 1, wherein displaying the plural elements comprises displaying the plural elements side-by-side to indicate concurrent execution of the respective steps.

36. The method of claim 35, further comprising displaying other elements in sequence with the plural side-by-side elements to indicate sequential execution of other steps corresponding to the other elements.

37. The method of claim 11, wherein determining the first execution plan comprises determining the first execution plan in a parallel database system environment, determining the second execution plan comprises determining the second execution plan in the parallel database system environment, and displaying each of the first and second execution plans comprises displaying plural elements corresponding to concurrently executing plural steps on respective processors of the parallel database system environment.

38. The method of claim 37, wherein displaying the plural elements comprises displaying the plural elements side-by-side to indicate concurrent execution of the respective steps.

39. The method of claim 38, further comprising displaying other elements in sequence with the plural side-by-side elements to indicate sequential execution of other steps corresponding to the other elements.

40. The article of claim 30, wherein displaying the plural elements comprises displaying the plural elements side-by-side to indicate concurrent execution of the respective steps.

41. The article of claim 40, further comprising displaying other elements in sequence with the plural side-by-side elements to indicate sequential execution of other steps corresponding to the other elements.